CITY OF
Albuquerque
Public Works Department

June 11, 1997

Martin J. Chávez, Mayor

Robert E. Gurulé, Director

Ronald R. Bohannan, P.E.
Tierra West Development Management Services
4421 McLeod Road NE, Suite D
Albuquerque, New Mexico 87109

RE: Revised Grading and Drainage Plan for Falcon Ridge Subdivision (C19/D16) Submitted for Preliminary Plat, Site Development and Grading Permit Approval, Engineer's Stamp Dated 5/19/97.

Dear Mr. Bohannan:

City Hydrology has no objection to the above referenced amended Grading and Drainage Plan, however, this plan must be finalized by the DRB. No grading may occur until the DRB approves this plan.

As you are aware, the Grading and Drainage Certification of the plan approved at DRB must be submitted to and approved by this office prior to release of financial guarantees.

If you should have any questions, please feel free to call me at 924-3982.

Sincerely,

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Andrew Garcia, City Hydrology
Larry Caudill, Environmental Health
Fred Aguirre, DRB-96-571
File

DRAINAGE REPORT

for

Falcon Ridge

Prepared by

Tierra West Development Management Services
4421 McLeod Road NE, Suite D
Albuquerque, New Mexico 87109

Prepared for

Fred Montano
Real Estate Services
12512 Modesto Avenue, NE
Albuquerque, New Mexico 87122

December 1996

Ronald R. Bohannan P.E. No. 7868

Location

Falcon Ridge Subdivision is a proposed 138 unit single family subdivision. It is located west of Wyoming Boulevard between Wilshire Avenue and Corona Avenue, NE. The site is shown on the attached Zone Atlas Map C-19 and contains approximately 17.416 acres. The site is identified as lots 7-26, block 6, tract 2, unit 3, North Albuquerque Acres. The purpose of this report is to provide the drainage analysis and management plan for the subdivision.

Existing Drainage Conditions

The site is currently undeveloped. The site lies within one existing drainage basin and contributes a runoff flow of 45.65 cfs which sheet flows west. There is one off-site undeveloped basin (Basin A) located north of the site that sheet flows south to impact the site. The 17.05 cfs of undeveloped runoff from this basin will be captured in Wilshire Avenue and conveyed to the proposed storm sewer system. All off-site flows from the east will be captured by a storm sewer system in Wyoming Boulevard and conveyed south. These flows will not impact the site. Until the Wyoming storm drain project is completed an interim solution to capture the flows from Wilshire Avenue will be in effect. See page 52 for the interim solution explanation and calculations.

FEMA Map and Soil Conditions

The site is located on FEMA Map section 350002 panel 10 and on FIRM Maps section 35001C0141D and 35001C0137D as shown on the attached excerpts. The map shows that the site lies within a 100 year flood plain. However, there is a Conditional Letter of Map Revision (CLOMR) request completed by Resource Technology, Inc. that will remove the northern portion of the flood plain. The CLOMR is based upon constructing a new storm sewer system in Wyoming Boulevard and was sent to FEMA on November 20, 1996. There is a Letter of Map Revision (LOMR) request that was also completed by Resource Technology, Inc. that will remove the southern portion on the flood plain based on the impact of the Lower North Domingo Baca Arroyo Detention Dam at Louisiana (FEMA case number 96-06-417P). Although the site is in no actual danger of flooding, the residents will be required to have flood insurance until the LOMR is granted and the improvements for the CLOMR are completed.

The site contains one type of soil according to the Soil Conservation Service Soil Survey of Bernalillo County. It is a Embudo gravelly fine sandy loam which has medium runoff and a medium hazard of water erosion.

On-Site Drainage Management Plan

The proposed drainage management plan is to collect the developed flows from the subdivision in Tricia and Peregrine Streets and convey the flows to a proposed storm drain system located in Murrelet Drive. The developed flows will then be conveyed to the Lower North Domingo Baca Arroyo Detention Dam by a 66" RCP. The pipe will outfall under the training dike into the concrete lined channel that runs into the detention dam.

There are five developed basins on the site. Basin 1 has a developed runoff flow of 16.82 cfs and drains to Tricia Street. Basin 2 has a developed runoff flow of 15.97 cfs and also drains to Tricia Street. Basin 3 and Basin 4 have developed runoff flows of 16.67 cfs and 17.64 cfs respectively, and drain to Peregrine Street. Basin 5 has a developed runoff flow of 6.89 cfs and drains to Murrelet Drive. Two double 'A' drop inlets with sweepers will collect the flows in Tricia and Peregrine Streets and a single 'A' inlet will collect the flows in Murrelet Drive. A 66"

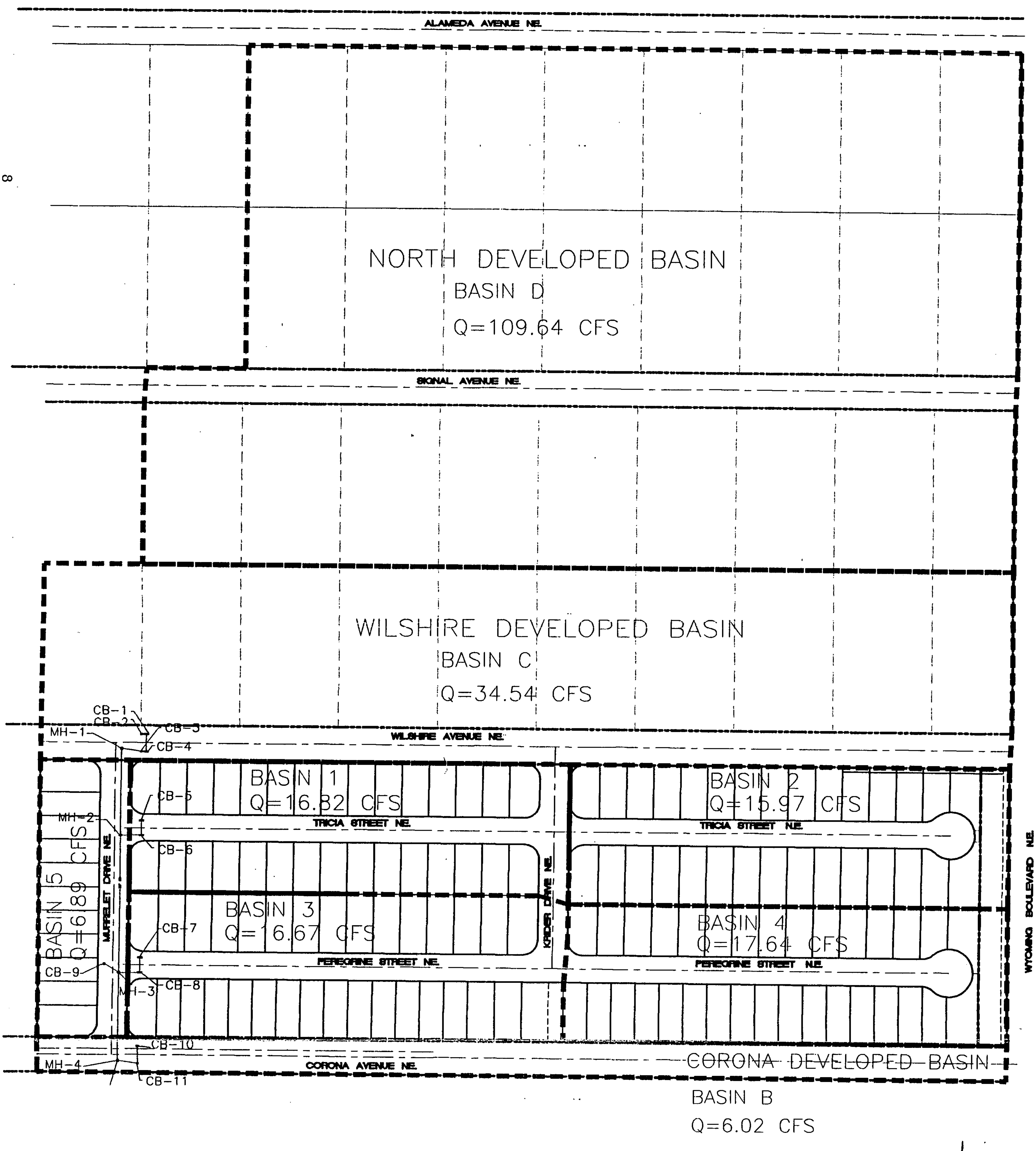
RCP pipe will then convey the developed flows to the detention dam.

There are three offsite developed basins that will also be intercepted by the proposed storm sewer system. Basin C consists of the future flow rate of 34.54 cfs from the undeveloped lots facing Wilshire Avenue and will be captured by double 'A' and single 'A' drop inlets in Wilshire Avenue. It will then be conveyed by a 24" RCP pipe to the proposed storm drain system in Murrelet Drive. The current undeveloped off-site basin (Basin A) north of Wilshire Avenue sheet flows south towards the site. The proposed storm drain line will be designed for the developed conditions and will have capacity for the undeveloped flow rate of 17.05 cfs. The second off-site developed basin (Basin ~~C~~ B) involves the flows from Corona Avenue. The developed flow rate of 6.02 cfs will be captured by single 'A' drop inlets and conveyed to the proposed storm sewer system by a 12" RCP pipe. There is a third developed off site basin (Basin D) located north of our site that is defined in the drainage report for the ZRC subdivision (C18-D16) as draining to the Lower Domingo Baca Detention Dam. This basin has a developed flow rate of 109.64 cfs and will have to drain through our site to reach the detention dam. To accommodate these flows the storm sewer pipes in Murrelet Drive are 54" RCP, 60" RCP, and 66" RCP. The flows will then be conveyed to the detention dam by a 66" RCP pipe. The pipe will discharge the total flow of 224.19 cfs into the 6' deep concrete lined channel that runs west into the detention dam. AMAFCA will have to approve the design of the outfall pipe into the detention dam

A National Pollutant Discharge Elimination System (NPDES) storm water discharge permit will need to be obtained before any grading occurs on the site. The site is larger than five acres and this permit is necessary or heavy fines can be levied.

Summary

There are five developed basin on the site. The flows are as follows: Basin 1 = 16.82 cfs, Basin 2 = 15.97 cfs, Basin 3 = 16.67 cfs, Basin 4 = 17.64 cfs, Basin 5 = 6.89 cfs. The developed flows will be captured by a proposed storm sewer system and conveyed to the Lower North Domingo Baca Arroyo Detention Dam. The future flows from the undeveloped lots north of Wilshire Avenue, the future flows in Corona Avenue, and the future flows from the northern upland basin defined by the ZRC subdivision will also be intercepted by the proposed storm drain line and conveyed to the detention dam.



DEVELOPED BASIN LAYOUT

RUNOFF CALCULATIONS

The site is in Zone 3

LAND TREATMENT

Proposed
B = 20%
C = 20%
D = 60%

Existing
B = 100%

DEPTH (INCHES) @ 100-YEAR STORM

P_{60} = 2.14 inches

P_{360} = 2.60 inches

P_{1440} = 3.10 inches

DEPTH (INCHES) @ 10-YEAR STORM

P_{60} = 2.14 x 0.667
= 1.43 inches

P_{360} = 1.73

P_{1440} = 2.07

See the summary output from AHYMO calculations.

DRAINAGE BASINS

On-site

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
1	172528.16	3.9607	0.006189
2	163748.13	3.7591	0.005874
3	170965.87	3.9248	0.006133
4	180897.85	4.1528	0.006489
5	70512.49	1.6187	0.002529
Total	758652.50	17.4163	0.027213

Off-site

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
A	283500.00	6.5083	0.010169
B (Corona)	51840.00	1.1901	0.001860
C (Wilshire)	379305.23	8.7076	0.013606
D (North)	1204477.18	27.6510	0.043205

RUNOFF CALCULATION RESULTS

On-site Existing

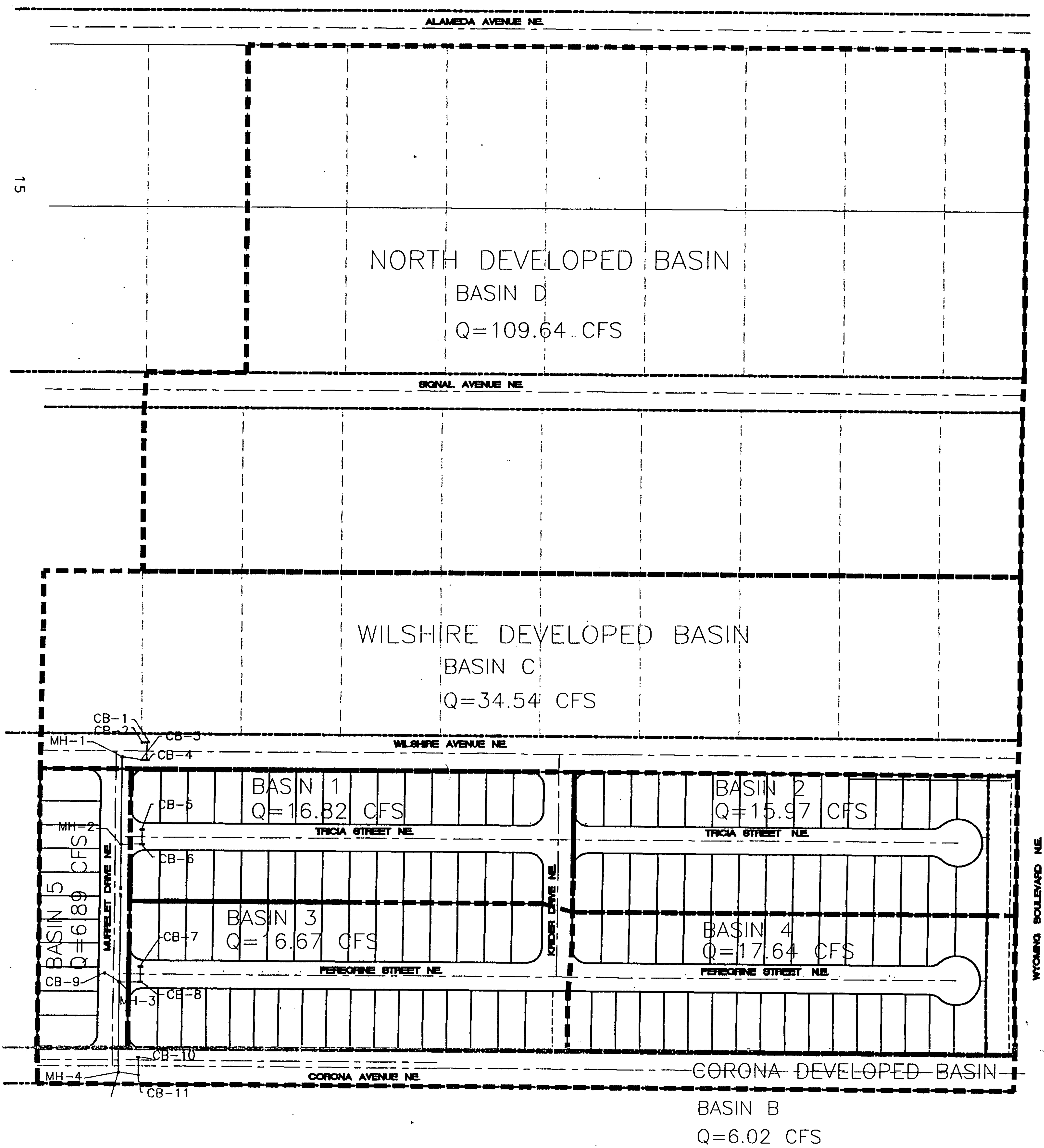
BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1	10.38	4.67	0.304	0.117
2	9.85	4.43	0.289	0.111
3	10.29	4.62	0.302	0.116
4	10.88	4.89	0.319	0.123
5	4.25	1.91	0.124	0.048
Total	45.65	20.52	1.338	0.515

On-Site Proposed

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1	16.82	10.43	0.610	0.358
2	15.97	9.9	0.579	0.340
3	16.67	10.34	0.605	0.355
4	17.64	10.94	0.640	0.375
5	6.89	4.27	0.249	0.146
Total	73.99	45.88	2.683	1.574

Off-site Existing

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
A	17.05	7.66	0.500	0.193
B (Corona)	6.02	4.00	0.234	0.148
C (Wilshire)	34.54	20.74	1.227	0.697
D (North)	109.64	65.82	3.896	2.212



DEVELOPED BASIN LAYOUT

UPLAND BASIN FROM ZRC SUBDIVISION

Street Capacity Calculations

TRICIA
28' F-F Street Section with 4" curb

For water depths less than 0.0625 feet

Y=	Water depth
Area =	16*Y^2
P=	SQRT(1025*Y^2) + Y
n=	0.017
Slope=	0.0319

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0016	0.330156	0.004846	0.000715	0.001431	0.447094	0.004471	0.7879	0.007213
0.02	0.0064	0.660312	0.009692	0.004542	0.009084	0.709718	0.014194	0.884388	0.016939
0.025	0.01	0.825391	0.012115	0.008236	0.016471	0.823554	0.020589	0.917898	0.022277
0.035	0.0196	1.155547	0.016962	0.020201	0.040401	1.030649	0.036073	0.970843	0.033642
0.045	0.0324	1.485703	0.021808	0.039484	0.078968	1.218636	0.054839	1.012371	0.045743
0.055	0.0484	1.815859	0.026654	0.067425	0.13485	1.393073	0.076619	1.046802	0.058441
0.06	0.0576	1.980937	0.029077	0.085033	0.170067	1.476272	0.088576	1.062094	0.064984
0.0625	0.0625	2.063476	0.030289	0.094813	0.189625	1.517	0.094813	1.069344	0.0683

For water depths greater than 0.0625 ft but less than 0.3025 ft

Y1=	Y-0.0625
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.063	0.063506	2.088981	0.030401	0.096576	0.193152	1.520734	0.095806	1.067714	0.068708
0.1	0.172656	3.976351	0.043421	0.333001	0.666003	1.928695	0.19287	1.07482	0.110015
0.13	0.311406	5.506651	0.056551	0.716285	1.43257	2.300162	0.299021	1.124239	0.151669
0.16	0.495156	7.036951	0.070365	1.317587	2.635174	2.660952	0.425752	1.172328	0.197068
0.2	0.810156	9.077351	0.08925	2.526041	5.052083	3.117968	0.623594	1.228652	0.261617
0.24	1.205156	11.11775	0.108399	4.277528	8.555056	3.549356	0.851845	1.27678	0.329661
0.2986	**1.92828**	**14.10694**	**0.13669**	**7.98841**	**15.97682**	**4.142764**	**1.237029**	**1.336033**	**0.434306**
0.3025	1.9825	14.30588	0.138579	8.288531	16.57706	4.180848	1.264707	1.339596	0.441452

For water depths greater than 0.3025 ft but less than 0.333 ft

Y2=	Y - 0.3025
A3=	A2 + Y2*14
P3=	P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.303	1.9895	14.30638	0.139064	8.337171	16.67434	4.190586	1.269748	1.341608	0.443015
0.308	2.0595	14.31138	0.143906	8.829727	17.65945	4.287316	1.320493	1.361389	0.458661
0.3102	2.0903	14.31358	0.146036	9.049977	18.09995	4.329511	1.343014	1.369904	0.465554
0.316	2.1715	14.31938	0.151648	9.640855	19.28171	4.439721	1.402952	1.391824	0.483748
0.32	2.2275	14.32338	0.155515	10.05691	20.11382	4.514886	1.444763	1.406513	0.496317
0.324	2.2835	14.32738	0.15938	10.47987	20.95974	4.589388	1.486962	1.42087	0.508902
0.327	2.3255	14.33038	0.162278	10.80158	21.60317	4.644843	1.518864	1.431427	0.518353
0.333	2.4095	14.33638	0.168069	11.45646	22.91292	4.754705	1.583317	1.452023	0.537284

For water depths greater than 0.333 ft but less than 0.513 ft

Y3=	Y - 0.333
A4=	A3 + 14 * Y3 + 25 * Y3^2
P4=	P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.335	2.4376	14.4364	0.168851	11.62599	23.25199	4.769443	1.597763	1.45217	0.540579
0.36	2.805725	15.68665	0.178861	13.90551	27.81103	4.956121	1.784204	1.455669	0.582652
0.39	3.288725	17.18695	0.19135	17.04951	34.09903	5.184232	2.021851	1.462932	0.635099
0.42	3.816725	18.68725	0.204242	20.66584	41.33169	5.414549	2.274111	1.472345	0.689389
0.45	4.389725	20.18755	0.217447	24.78212	49.56423	5.645483	2.540467	1.483088	0.74528
0.48	5.007725	21.68785	0.2309	29.42536	58.85071	5.875993	2.820477	1.494627	0.802586
0.513	5.7395	23.33818	0.245928	35.17311	70.34621	6.128253	3.143794	1.507822	0.867082

Street Capacity Calculations

PEREGRINE
28' F-F Street Section with 4" curb

For water depths less than 0.0625 feet

Y=	Water depth
Area =	16*Y^2
P=	SQRT(1025*Y^2) + Y
n=	0.017
Slope=	0.0329

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0016	0.330156	0.004846	0.000726	0.001453	0.454048	0.00454	0.800154	0.007371
0.02	0.0064	0.660312	0.009692	0.004613	0.009226	0.720756	0.014415	0.898142	0.017301
0.025	0.01	0.825391	0.012115	0.008364	0.016727	0.836363	0.020909	0.932174	0.022748
0.035	0.0196	1.155547	0.016962	0.020515	0.04103	1.046679	0.036634	0.985942	0.034345
0.045	0.0324	1.485703	0.021808	0.040098	0.080196	1.237589	0.055692	1.028116	0.04669
0.055	0.0484	1.815859	0.026654	0.068473	0.136947	1.41474	0.077811	1.063083	0.059641
0.06	0.0576	1.980937	0.029077	0.086356	0.172712	1.499233	0.089954	1.078613	0.066315
0.0625	0.0625	2.063476	0.030289	0.096287	0.192574	1.540594	0.096287	1.085976	0.069696

For water depths greater than 0.0625 ft but less than 0.3025 ft

Y1=	Y-0.0625
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.063	0.063506	2.088981	0.030401	0.098078	0.196156	1.544386	0.097296	1.08432	0.070114
0.1	0.172656	3.976351	0.043421	0.33818	0.676361	1.958692	0.195869	1.091537	0.112262
0.13	0.311406	5.506651	0.056551	0.727425	1.45485	2.335936	0.303672	1.141725	0.154737
0.16	0.495156	7.036951	0.070365	1.33808	2.676159	2.702338	0.432374	1.190561	0.201021
0.2	0.810156	9.077351	0.08925	2.565329	5.130658	3.166462	0.633292	1.247761	0.266814
0.24	1.205156	11.11775	0.108399	4.344057	8.688113	3.604559	0.865094	1.296637	0.33616
0.28	1.680156	13.15815	0.127689	6.754928	13.50986	4.020416	1.125717	1.338949	0.408369
0.3025	1.9825	14.30588	0.138579	8.417443	16.83489	4.245873	1.284377	1.360431	0.450074

For water depths greater than 0.3025 ft but less than 0.333 ft

Y2=	Y - 0.3025
A3=	A2 + Y2*14
P3=	P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.303	1.9895	14.30638	0.139064	8.466839	16.93368	4.255762	1.289496	1.362474	0.451666
0.3066	**2.0399**	**14.30998**	**0.142551**	**8.825853**	**17.65171**	**4.326611**	**1.326539**	**1.377**	**0.46313**
0.3102	2.0903	14.31358	0.146036	9.190732	18.38146	4.396848	1.363902	1.39121	0.474608
0.316	2.1715	14.31938	0.151648	9.7908	19.5816	4.508773	1.424772	1.413471	0.493129
0.32	2.2275	14.32338	0.155515	10.21332	20.42665	4.585106	1.467234	1.428389	0.505922
0.324	2.2835	14.32738	0.15938	10.64286	21.28572	4.660767	1.510089	1.442969	0.518733
0.3223	2.2597	14.32568	0.157738	10.45946	20.91891	4.628692	1.491827	1.436813	0.513286
0.333	2.4095	14.33638	0.168069	11.63464	23.26929	4.828655	1.607942	1.474607	0.547622

For water depths greater than 0.333 ft but less than 0.513 ft

Y3=	Y - 0.333
A4=	A3 + 14 * Y3 + 25 * Y3^2
P4=	P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.335	2.4376	14.4364	0.168851	11.80681	23.61363	4.843622	1.622613	1.474755	0.55098
0.36	2.805725	15.68665	0.178861	14.12179	28.24357	5.033204	1.811953	1.478309	0.593857
0.39	3.288725	17.18695	0.19135	17.31469	34.62937	5.264863	2.053297	1.485685	0.647303
0.42	3.816725	18.68725	0.204242	20.98726	41.97452	5.498761	2.30948	1.495245	0.70262
0.45	4.389725	20.18755	0.217447	25.16755	50.33511	5.733287	2.579979	1.506154	0.759565
0.48	5.007725	21.68785	0.2309	29.88301	59.76602	5.967382	2.864344	1.517873	0.817948
0.513	5.7395	23.33818	0.245928	35.72015	71.44031	6.223566	3.192689	1.531273	0.883653

FINDING STREET CAPACITY - 28 F-F CROSS-SECTION FOR 4" CURB

Q = 1.49/n A R^(2/3) S^½
n = 0.017
SLOPE = STREET SLOPE
R^2/3 = (A/P)^2/3
D2 = HYDRAULIC DEPTH AFTER HYDRAULIC JUMP = D1/2 [SQRT $(1 + 8Fr^2)$ - 1]
E = $V^2 / 2g$

HALF STREET CALCULATIONS

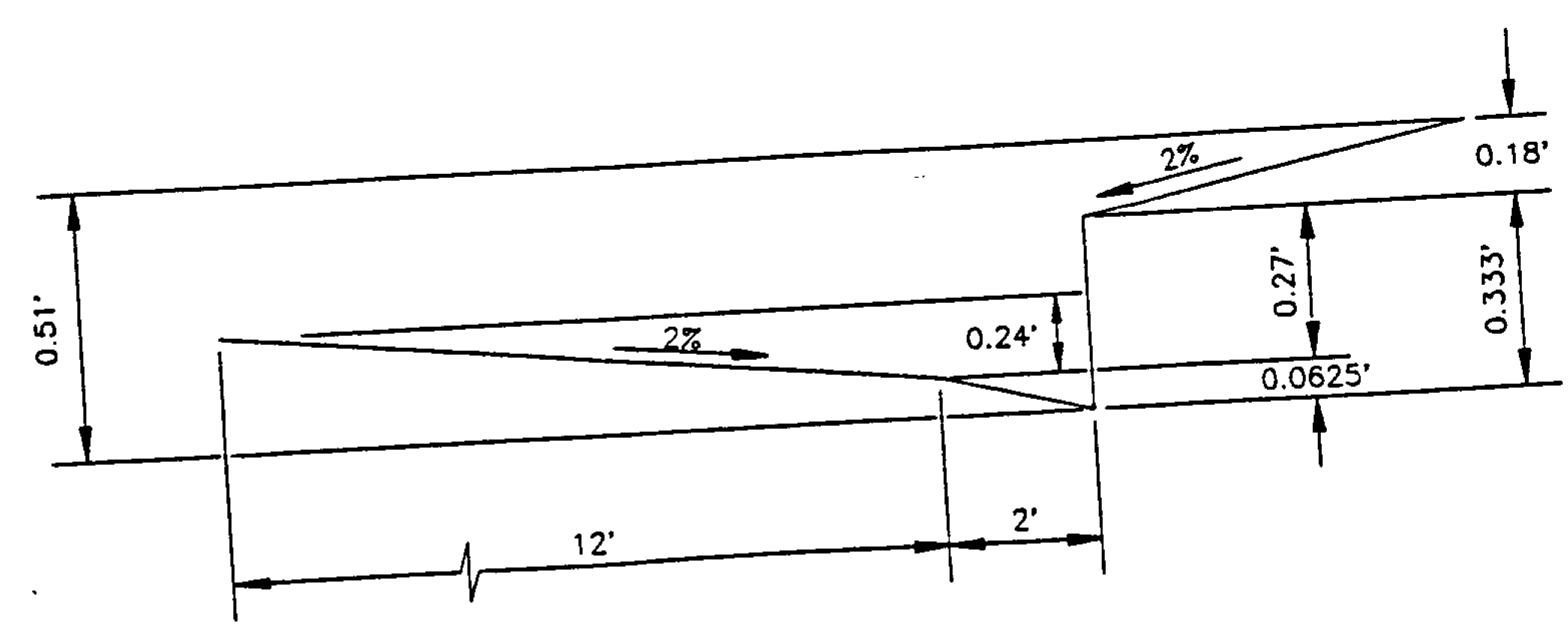
@Y < = 0.0625
A1 = ½ Y (Y/0.03125) = $16Y^2$
P1 = SQRT[Y^2 + $(Y/0.03125)^2$] + Y = SQRT(1025 Y^2) + Y

@ 0.0625 < Y < = 0.3025 & Y1 = Y - 0.0625
A2 = A1 + ½Y1 (Y1/0.02) + 2Y1 = A1 + $25Y1^2$ + 2Y1
P2 = P1 + SQRT[$Y1^2$ + $(Y1/0.02)^2$] + Y1 = P1 + SQRT(2501 Y^2) + Y1

@ 0.3025 < Y < = 0.333 & Y2 = Y - 0.3025
A3 = A2 + 14Y2
P3 = P2 + Y2

@ 0.333 < Y < = 0.513 & Y3 = Y - 0.333
A4 = A3 + 14Y3 + ½Y3[Y3/(0.02)] = A3 + 14 Y3 + 25 $Y3^2$
P4 = P3 + SQRT($Y3^2$ + $[Y3/(0.02)]^2$) = P3 + SQRT(2501 $Y3^2$)

SEE THE FOLLOWING SHEET FOR INPUT AND OUTPUT FILE FOR CALCULATION RESULTS FROM COMPUTER PROGRAM USING THE EQUATION SHOWN ABOVE



28' F—F
4" CURB
NOT TO SCALE

FINDING STREET CAPACITY - 28 F-F CROSS-SECTION FOR 8" CURB

$Q = 1.49/n \; A \; R^{(2/3)} \; S^{1/2}$
n = 0.017
SLOPE = STREET SLOPE
$R^{2/3} = (A/P)^{2/3}$
D2 = WATER DEPTH AFTER HYDRAULIC JUMP = $D1/2 \, [SQRT(1 + 8Fr^2) - 1]$
$E = V^2 / 2g$

HALF STREET CALCULATIONS

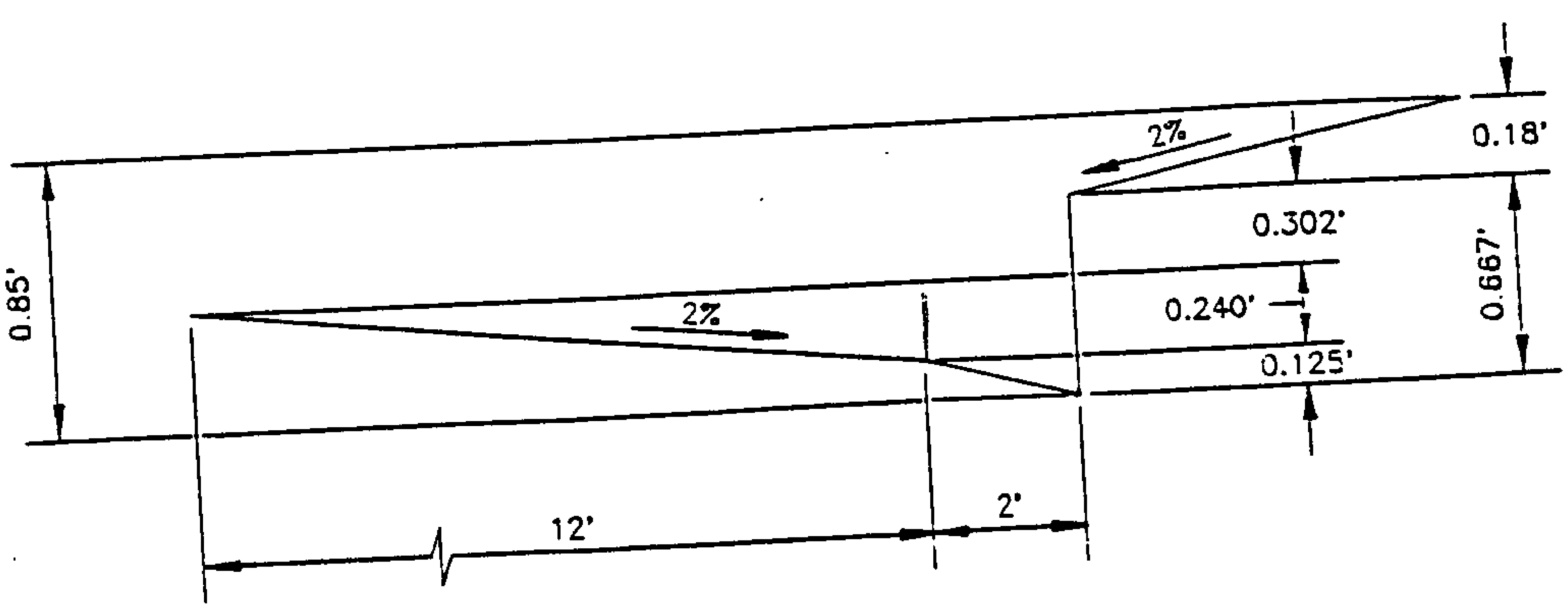
@Y < = 0.125
$A1 = ½ Y (Y/0.0625) = 8Y^2$
$P1 = SQRT[Y^2 + (Y/0.0625)^2] + Y = SQRT(257 Y^2) + Y$

@ 0.125 < Y < = 0.365 & Y1 = Y - 0.125
$A2 = A1 + ½Y1 (Y1/0.02) + 2Y1 = A1 + 25Y1^2 + 2Y1$
$P2 = P1 + SQRT[Y1^2 + (Y1/0.02)^2] + Y1 = P1 + SQRT(2501 Y1^2) + Y1$

@ 0.365 < Y < = 0.667 & Y2 = Y - 0.365
A3 = A2 + 14Y2 + ~~½Y2[Y2/(0.02)]~~ = A2 + 14 Y2
P3 = P2 + ~~SQRT(Y2² + [Y2/(0.02)]²)~~ = P2 + Y2

@ 0.667 < Y < = 0.847 & Y3 = Y - 0.667
$A4 = A3 + 14Y3 + ½Y3[Y3/(0.02)] = A3 + 14 Y3 + 25 Y3^2$
$P4 = P3 + SQRT(Y3^2 + [Y3/(0.02)]^2) = P3 + SQRT(2501 Y3^2)$

SEE THE FOLLOWING SHEET FOR INPUT AND OUTPUT FILE FOR CALCULATION RESULTS FROM COMPUTER PROGRAM USING THE EQUATION SHOWN ABOVE



28' F—F
8" CURB
NOT TO SCALE

FINDING STREET CAPACITY – 32 F–F CROSS–SECTION FOR 8" CURB

Q = 1.49/n A R^(2/3) S^½
n = 0.017
SLOPE = STREET SLOPE
R^2/3 = (A/P)^2/3
D2 = WATER DEPTH AFTER HYDRAULIC JUMP = D1/2 [SQRT (1 + 8Fr²) – 1]
E = V² / 2g

<u>HALF STREET CALCULATIONS</u>

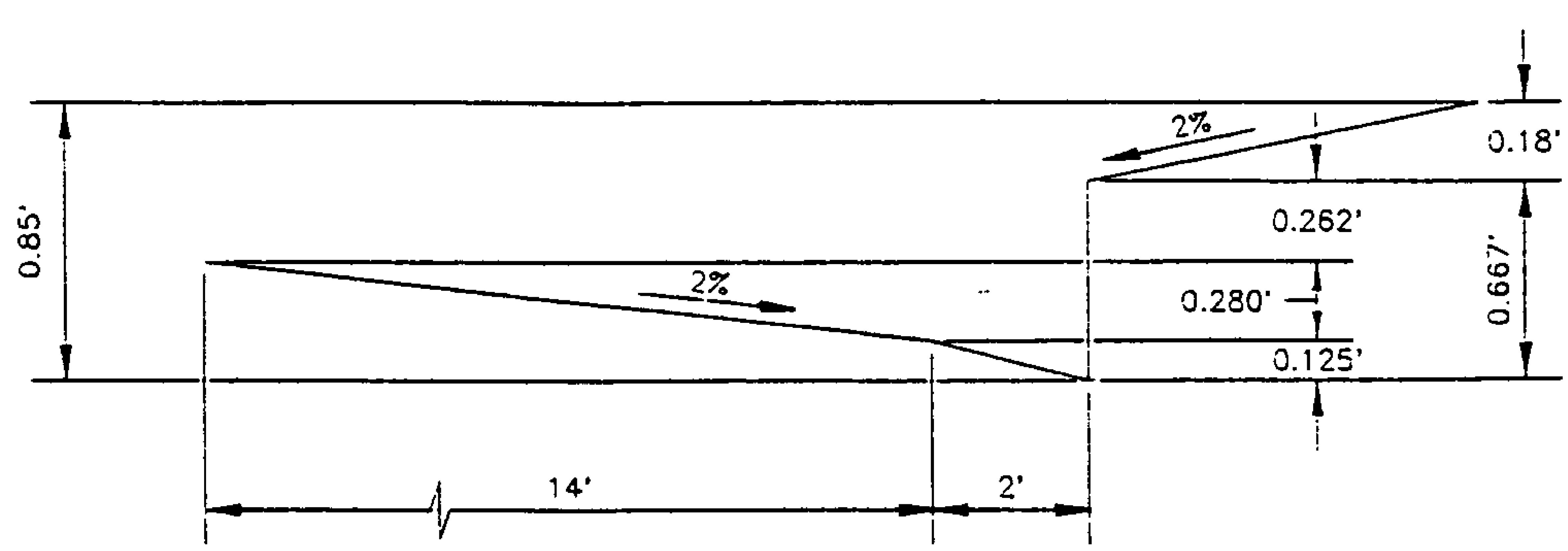
@Y ≤ 0.125
A1 = ½ Y (Y/0.0625) = 8Y²
P1 = SQRT[Y² + (Y/0.0625)²] + Y = SQRT(257 Y²) + Y

@ 0.125 < Y ≤ 0.405 & Y1 = Y – 0.125
A2 = A1 + ½Y1 (Y1/0.02) + 2Y1 = A1 + 25Y1² + 2Y1
P2 = P1 + SQRT[Y1² + (Y1/0.02)²] + Y1 = P1 + SQRT(2501 Y1²) + Y1

@ 0.405 < Y ≤ 0.667 & Y2 = Y – 0.405
A3 = A2 + 16Y2 + ½Y2[Y2/(0.02)] = A2 + 16 Y2
P3 = P2 + SQRT(Y2² + [Y2/(0.02)]²) = P2 + Y2

@ 0.667 < Y ≤ 0.847 & Y3 = Y – 0.667
A4 = A3 + 16Y3 + ½Y3[Y3/(0.02)] = A3 + 16 Y3 + 25 Y3²
P4 = P3 + SQRT(Y3² + [Y3/(0.02)]²) = P3 + SQRT(2501 Y3²)

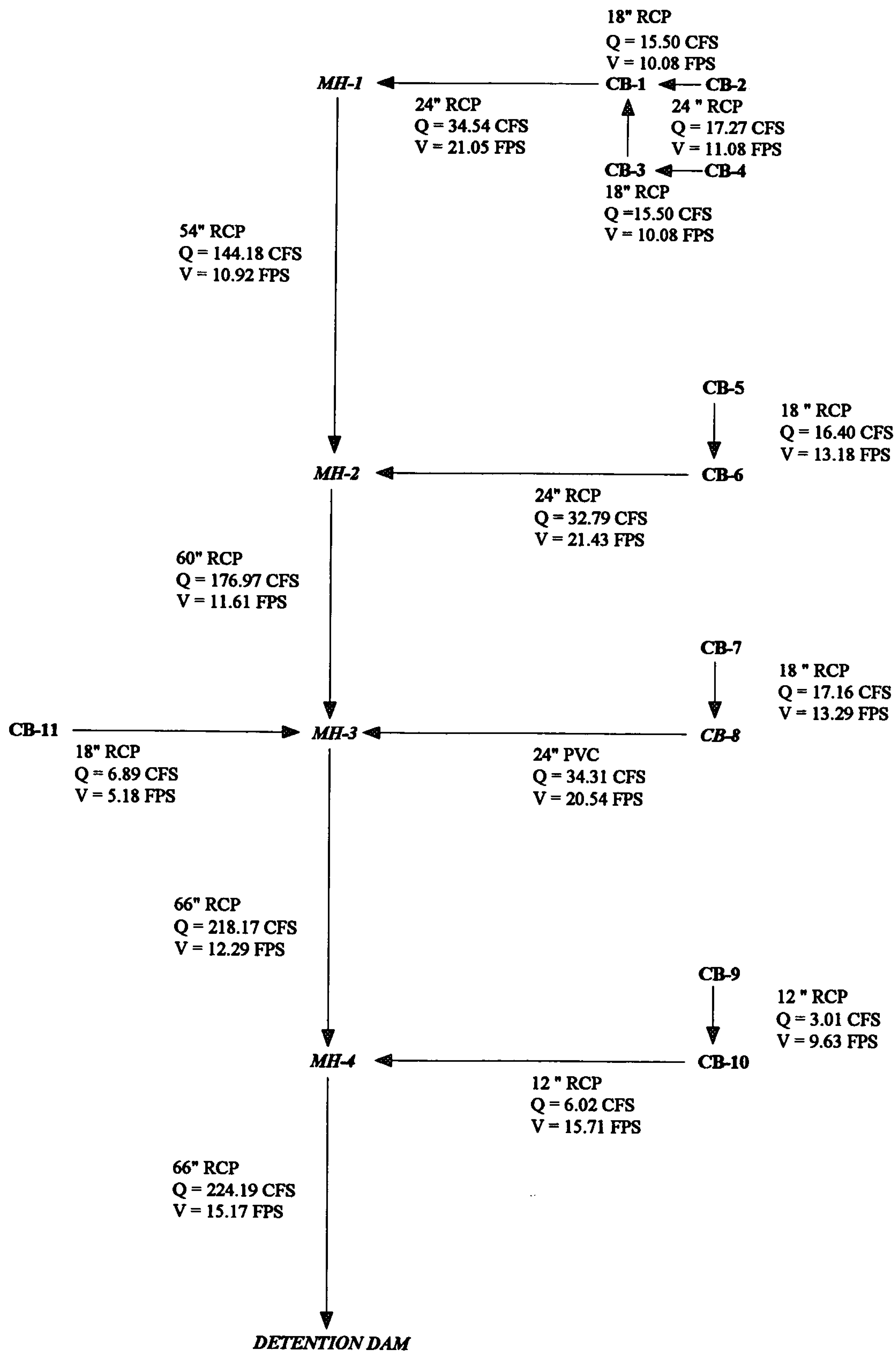
SEE THE FOLLOWING SHEET FOR INPUT AND OUTPUT FILE FOR CALCULAITON RESULTS FROM COMPUTER PROGRAM USING THE EQUATION SHWON ABOVE



32' F–F
8" CURB

NOT TO SCALE

STORM SEWER FLOW PATH



HYDRAULIC GRADE LINE

<u>MANNING'S EQUATION</u>

Q=1.49/n * A * R^(3/2) * S^(1/2)

DEPTH (IN)	DEPTH (FT)	DIAMETER (IN)	SLOPE (FT/FT)	THETA	AREA (FT^2)	WP	R	Q (CFS)	V (FPS)
14.63	1.22	18	0.022	4.49	1.54	3.37	0.46	15.50	10.08
11.92	0.99	24	0.0237	3.13	1.56	3.13	0.50	17.26	11.08
14.63	1.22	18	0.022	4.49	1.54	3.37	0.46	15.50	10.08
12.42	1.04	24	0.08261	3.21	1.64	3.21	0.51	34.54	21.05
41.77	3.48	54	0.006	4.30	13.20	9.67	1.36	144.19	10.92
11.94	1.00	18	0.04	3.81	1.24	2.86	0.44	16.40	13.18
11.75	0.98	24	0.08971	3.10	1.53	3.10	0.49	32.77	21.43
43.47	3.62	60	0.006	4.07	15.24	10.18	1.50	176.95	11.61
12.35	1.03	18	0.04	3.90	1.29	2.93	0.44	17.17	13.29
12.60	1.05	24	0.07771	3.24	1.67	3.24	0.52	34.32	20.54
12.69	1.06	18	0.006	3.99	1.33	2.99	0.45	6.89	5.18
46.17	3.85	66	0.006	3.96	17.75	10.90	1.63	218.18	12.29
5.03	0.42	12	0.05263	2.82	0.31	1.41	0.22	3.01	9.63
5.89	0.49	12	0.1212	3.10	0.38	1.55	0.25	6.03	15.71
39.37	3.28	66	0.01	3.53	14.78	9.71	1.52	224.21	15.17

Pipe Capacity

Manning's Equation:

Q = 1.49/n * A * R^(2/3) * S^(1/2)

A = Area
R = D/4
S = Slope
n = 0.013

Pipe	D	Slope	Area	R	Q Provided	Q Required	Velocity
	(in)	(%)	(ft^2)		(cfs)	(cfs)	(ft/s)
CB1 to CB2	18	2.2	1.77	0.375	15.62	15.50	8.77
CB3 to CB1	24	2.37	3.14	0.5	34.92	17.27	5.50
CB4 to CB3	18	2.2	1.77	0.375	15.62	15.50	8.77
CB4 to MH1	24	8.261	3.14	0.5	65.20	34.54	10.99
MH1 to MH2	54	0.6	15.90	1.125	152.73	144.18	9.07
CB5 to CB6	18	4	1.77	0.375	21.07	16.40	9.28
CB6 to MH2	24	8.971	3.14	0.5	67.94	32.79	10.44
MH2 to MH3	60	0.6	19.63	1.25	202.28	176.97	9.01
CB7 to CB8	18	4	1.77	0.375	21.07	17.16	9.71
CB8 to MH3	24	7.771	3.14	0.5	63.23	34.31	10.92
CB11 to MH3	18	0.6	1.77	0.375	8.16	6.89	3.90
MH3 TO MH4	66	0.6	23.76	1.375	260.82	218.17	9.18
CB9 to CB10	12	5.263	0.79	0.25	8.20	3.01	3.83
CB10 to MH4	12	12.12	0.79	0.25	12.44	6.02	7.66
MH4 to DAM	66	1	23.76	1.375	336.71	224.19	9.44

Manhole Calculations

ORIFICE EQUATION

Q = CA sqrt(2gH)

C = 0.6

A= Area of orifice

g = 32.2

H= Depth

Manhole	Pipe D (IN)	Area (SF)	Q (CFS)	Depth (FT)	Depth Allow (FT)
1	54	15.90	144.18	3.5467	6.86
2	60	15.90	176.97	5.3434	8.73
3	66	19.63	218.17	5.3280	8.21
4	66	19.63	224.19	5.6260	10.49

DROP INLET HEAD CAPACITY

SINGLE 'A'

Orifice Equation:

$$Q = CA\sqrt{2gH}$$

Q = Flow (cfs)
C = 0.60
A = Area of drop inlet (ft^2)
g = 32.2
H = Height of water above drop inlet (ft)

$$H = \frac{\left(\frac{Q}{C*A}\right)^2}{2g}$$

$$H = \frac{\left(\frac{6.89}{0.6*6.18}\right)^2}{2*32.2}$$

H = 0.05 feet

Allowable depth = 0.847 feet
Required depth = 0.05 feet

0.05 feet < 0.847 feet

STORM DROP INLET-EFFECTIVE AREA

Single 'A'

Area at the grate:

L = 38.375" - 7(½" $_{\text{middle bars}}$)
= 34.875"
= 2.906'

W = 25.5" - 13(½" $_{\text{middle bars}}$)
= 19"
= 1.583'

Area = 1.583' x 2.906'
= 4.601 ft^2

Effective Area = 4.601- 4.601 (0.5 $_{\text{clogging factor}}$)
= 2.30 ft^2 at the grate

Area at the throat:

L = 89.375"
= 7.45'

H = 10¾" - 4½"
= 6¼"
= 0.5208'

Area = 7.45' x 0.5208'
= 3.88 ft^2 at the throat

Total Area:

Area = $2.30_{grate} + 3.88_{throat}$
= 6.18 ft^2

Street Capacity Calculations

TRICIA
28' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.0319

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.00035	0.000701	0.437886	0.004379	0.771673	0.007004
0.02	0.0032	0.340624	0.009395	0.002224	0.004449	0.695101	0.013902	0.866174	0.016461
0.04	0.0128	0.681249	0.018789	0.014124	0.028247	1.103404	0.044136	0.972247	0.038522
0.06	0.0288	1.021873	0.028184	0.041641	0.083282	1.445869	0.086752	1.04022	0.063225
0.08	0.0512	1.362498	0.037578	0.089679	0.179358	1.751545	0.140124	1.091311	0.089786
0.1	0.08	1.703122	0.046973	0.162599	0.325198	2.032488	0.203249	1.132661	0.117805
0.12	0.1152	2.043746	0.056367	0.264404	0.528808	2.295174	0.275421	1.167608	0.147034
0.125	0.125	2.128902	0.058716	0.294812	0.589623	2.358494	0.294812	1.175579	0.15451

For water depths greater than 0.125 ft but less than 0.365 ft

Y1=	Y-0.125
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.313208	0.626416	2.309369	0.300218	1.12874	0.152458
0.16	0.225625	3.914252	0.057642	0.525627	1.051255	2.329651	0.372744	1.026368	0.165633
0.2	0.415625	5.954652	0.069798	1.100011	2.200022	2.646643	0.529329	1.042924	0.211473
0.24	0.685625	7.995052	0.085756	2.081591	4.163182	3.036049	0.728652	1.092132	0.269622
0.3045	1.289506	11.2852	0.114265	4.740581	9.481161	3.676276	1.119426	1.17405	0.375756
0.32	1.465625	12.07585	0.121368	5.609078	11.21816	3.827089	1.224669	1.192245	0.402772
0.36	1.975625	14.11625	0.139954	8.314315	16.62863	4.208448	1.515041	1.236069	0.47454
0.365	2.045	14.3713	0.142297	8.702085	17.40417	4.255298	1.553184	1.24124	0.483698

For water depths greater than 0.365 ft but less than 0.667 ft

Y2=	Y - 0.365
A3=	A2 + Y2*14
P3=	P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.37	2.115	14.3763	0.147117	9.202046	18.40409	4.350849	1.609814	1.260507	0.500025
0.41	2.675	14.4163	0.185554	13.58633	27.17267	5.079003	2.082391	1.397844	0.631032
0.433	**2.997**	**14.4393**	**0.207559**	**16.40259**	**32.80517**	**5.473002**	**2.36981**	**1.465729**	**0.706788**
0.49	3.795	14.4963	0.261791	24.24637	48.49274	6.38903	3.130625	1.608455	0.896212
0.54	4.495	14.5463	0.309013	32.07596	64.15192	7.13592	3.853397	1.711296	1.064474
0.59	5.195	14.5963	0.355912	40.73296	81.46591	7.8408	4.626072	1.798898	1.23469
0.63	5.755	14.6363	0.3932	48.22289	96.44577	8.379303	5.278961	1.860414	1.37221
0.667	6.273	14.6733	0.427511	55.57833	111.1567	8.859928	5.909572	1.911786	1.500429

For water depths greater than 0.667 ft but less than 0.847 ft

Y3=	Y - 0.667
A4=	A3 + 14 * Y3 + 25 * Y3^2
P4=	P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.762225	16.32363	0.41426	58.66828	117.3366	8.675885	6.073119	1.827413	1.492594
0.72	7.085225	17.32383	0.408987	60.94789	121.8958	8.60211	6.19352	1.786532	1.494387
0.74	7.428225	18.32403	0.405382	63.52231	127.0446	8.551479	6.328094	1.751852	1.500308
0.76	7.791225	19.32423	0.403184	66.38551	132.771	8.520549	6.475617	1.722395	1.509833
0.78	8.174225	20.32443	0.402187	69.53401	139.068	8.506495	6.635066	1.697366	1.522528
0.8	8.577225	21.32463	0.402221	72.96628	145.9326	8.50698	6.805584	1.67611	1.53803
0.847	9.603	23.6751	0.405616	82.15151	164.303	8.554775	7.245895	1.638095	1.583856

Street Capacity Calculations

PEREGRINE
28' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017
Slope= 0.0329

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000356	0.000712	0.444697	0.004447	0.783675	0.007159
0.02	0.0032	0.340624	0.009395	0.002259	0.004518	0.705912	0.014118	0.879646	0.016815
0.04	0.0128	0.681249	0.018789	0.014343	0.028686	1.120566	0.044823	0.987369	0.039327
0.06	0.0288	1.021873	0.028184	0.042289	0.084577	1.468356	0.088101	1.056399	0.064525
0.08	0.0512	1.362498	0.037578	0.091074	0.182148	1.778787	0.142303	1.108284	0.091614
0.1	0.08	1.703122	0.046973	0.165128	0.330256	2.0641	0.20641	1.150278	0.120185
0.12	0.1152	2.043746	0.056367	0.268516	0.537033	2.330871	0.279704	1.185768	0.149986
0.125	0.125	2.128902	0.058716	0.299397	0.598794	2.395175	0.299397	1.193863	0.157607

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.31808	0.636159	2.345287	0.304887	1.146295	0.15554
0.16	0.225625	3.914252	0.057642	0.533803	1.067605	2.365884	0.378541	1.042331	0.169051
0.2	0.415625	5.954652	0.069798	1.11712	2.234239	2.687807	0.537561	1.059144	0.215821
0.24	0.685625	7.995052	0.085756	2.113966	4.227932	3.083269	0.739985	1.109118	0.275111
0.3045	1.289506	11.2852	0.114265	4.814311	9.628622	3.733453	1.136836	1.19231	0.38329
0.32	1.465625	12.07585	0.121368	5.696316	11.39263	3.886612	1.243716	1.210789	0.410823
0.36	1.975625	14.11625	0.139954	8.443628	16.88726	4.273902	1.538605	1.255294	0.483956
0.365	2.045	14.3713	0.142297	8.837429	17.67486	4.321481	1.577341	1.260545	0.493287

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365
A3= A2 + Y2*14
P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.37	2.115	14.3763	0.147117	9.345165	18.69033	4.418518	1.634852	1.280112	0.509908
0.41	2.675	14.4163	0.185554	13.79764	27.59529	5.157997	2.114779	1.419584	0.643258
0.437	**3.053**	**14.4433**	**0.211378**	**17.17651**	**34.35301**	**5.626108**	**2.458609**	**1.499821**	**0.733812**
0.49	3.795	14.4963	0.261791	24.62347	49.24695	6.488399	3.179315	1.633471	0.913149
0.54	4.495	14.5463	0.309013	32.57484	65.14968	7.246905	3.913329	1.737912	1.084386
0.59	5.195	14.5963	0.355912	41.36648	82.73295	7.962748	4.698021	1.826876	1.257603
0.63	5.755	14.6363	0.3932	48.9729	97.9458	8.509626	5.361064	1.889349	1.397544
0.667	6.273	14.6733	0.427511	56.44274	112.8855	8.997726	6.001484	1.94152	1.528016

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667
A4= A3 + 14 * Y3 + 25 * Y3^2
P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.762225	16.32363	0.41426	59.58075	119.1615	8.810821	6.167575	1.855835	1.520225
0.72	7.085225	17.32383	0.408987	61.89581	123.7916	8.735899	6.289848	1.814318	1.522149
0.74	7.428225	18.32403	0.405382	64.51027	129.0205	8.68448	6.426516	1.779099	1.528267
0.76	7.791225	19.32423	0.403184	67.41801	134.836	8.653069	6.576333	1.749184	1.538046
0.78	8.174225	20.32443	0.402187	70.61547	141.2309	8.638797	6.738262	1.723765	1.551046
0.8	8.577225	21.32463	0.402221	74.10113	148.2023	8.639289	6.911431	1.702178	1.566898
0.847	9.603	23.6751	0.405616	83.42921	166.8584	8.687828	7.35859	1.663572	1.613697

Street Capacity Calculations

CORONA AVE

32' F-F Street Section with 8" curb

(Future Conditions)

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.0288

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000333	0.000666	0.416066	0.004161	0.73322	0.006512
0.02	0.0032	0.340624	0.009395	0.002113	0.004227	0.660464	0.013209	0.823012	0.015335
0.04	0.0128	0.681249	0.018789	0.01342	0.02684	1.048421	0.041937	0.923799	0.035954
0.06	0.0288	1.021873	0.028184	0.039566	0.079132	1.37382	0.082429	0.988385	0.059071
0.08	0.0512	1.362498	0.037578	0.08521	0.170421	1.664264	0.133141	1.03693	0.083947
0.1	0.08	1.703122	0.046973	0.154497	0.308993	1.931208	0.193121	1.07622	0.110203
0.12	0.1152	2.043746	0.056367	0.251229	0.502457	2.180803	0.261696	1.109425	0.137605
0.125	0.125	2.128902	0.058716	0.280121	0.560242	2.240968	0.280121	1.116999	0.144615

For water depths greater than 0.125 ft but less than 0.405 ft

Y1=	Y-0.125
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.297601	0.595201	2.194291	0.285258	1.072493	0.142613
0.16	0.225625	3.914252	0.057642	0.499435	0.99887	2.213562	0.35417	0.975223	0.154722
0.196	0.393025	5.750612	0.068345	0.974594	1.949188	2.479725	0.486026	0.987069	0.192623
0.246	0.733025	8.301112	0.088304	2.156287	4.312574	2.941628	0.723641	1.045183	0.260856
0.2705	**0.945256**	**9.550857**	**0.098971**	**3.000225**	**6.00045**	**3.173981**	**0.858562**	**1.075456**	**0.297821**
0.32	1.465625	12.07585	0.121368	5.329573	10.65915	3.636382	1.163642	1.132835	0.37705
0.3476	1.808969	13.48373	0.134159	7.032526	14.06505	3.887588	1.351326	1.162017	0.42328
0.395	2.4875	15.9016	0.156431	10.71299	21.42598	4.30673	1.701158	1.207594	0.505397
0.405	2.645	16.4117	0.161165	11.62001	23.24002	4.393199	1.779245	1.216537	0.523109

For water depths greater than 0.405 ft but less than 0.667 ft

Y2=	Y - 0.405
A3=	A2 + Y2*16
P3=	P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.41	2.725	16.4167	0.165989	12.20918	24.41835	4.480432	1.836977	1.233105	0.538796
0.43	3.045	16.4367	0.185256	14.67918	29.35836	4.820749	2.072922	1.295545	0.601646
0.5074	4.2834	16.5141	0.259378	25.84306	51.68611	6.033304	3.061299	1.49263	0.847006
0.517	4.437	16.5237	0.268523	27.39536	54.79071	6.174297	3.192112	1.513263	0.877716
0.55	4.965	16.5567	0.299879	32.9976	65.9952	6.646042	3.655323	1.579261	0.983783
0.59	5.605	16.5967	0.337718	40.32221	80.64441	7.193971	4.244443	1.650497	1.113393
0.6658	6.8178	16.6725	0.408925	55.71935	111.4387	8.172629	5.441336	1.76507	1.362074
0.667	6.837	16.6737	0.410047	55.97843	111.9569	8.187573	5.461111	1.766706	1.366042

For water depths greater than 0.667 ft but less than 0.847 ft

Y3=	Y - 0.667
A4=	A3 + 16 * Y3 + 25 * Y3^2
P4=	P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	7.392225	18.32403	0.403417	59.8702	119.7404	8.099077	5.669354	1.70592	1.374662
0.73	7.944225	19.82433	0.400731	64.05499	128.11	8.063089	5.886055	1.663076	1.390288
0.75	8.337225	20.82453	0.400356	67.18183	134.3637	8.058057	6.043542	1.639728	1.404163
0.77	8.750225	21.82473	0.400932	70.57738	141.1548	8.065779	6.21065	1.619843	1.420446
0.8	9.407225	23.32503	0.40331	76.17641	152.3528	8.09765	6.47812	1.595461	1.448846
0.82	9.870225	24.32523	0.405761	80.24905	160.4981	8.130417	6.666942	1.58226	1.470125
0.85	10.60223	25.82553	0.410533	86.87503	173.7501	8.194038	6.964932	1.566248	1.50513

Street Capacity Calculations

WILSHIRE AVE
32' F-F Street Section with 8" curb
(Future Conditions)

For water depths less than 0.125 feet

Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017
Slope= 0.0304

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000342	0.000684	0.427467	0.004275	0.753312	0.006768
0.02	0.0032	0.340624	0.009395	0.002171	0.004343	0.678562	0.013571	0.845564	0.015923
0.04	0.0128	0.681249	0.018789	0.013788	0.027575	1.07715	0.043086	0.949114	0.037294
0.06	0.0288	1.021873	0.028184	0.04065	0.0813	1.411466	0.084688	1.015469	0.061239
0.08	0.0512	1.362498	0.037578	0.087545	0.175091	1.709869	0.13679	1.065344	0.086994
0.1	0.08	1.703122	0.046973	0.15873	0.31746	1.984127	0.198413	1.105711	0.11417
0.12	0.1152	2.043746	0.056367	0.258113	0.516226	2.240562	0.268867	1.139826	0.142527
0.122	0.119072	2.077809	0.057307	0.269744	0.539489	2.265389	0.276377	1.14297	0.14542

For water depths greater than 0.125 ft but less than 0.405 ft

Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.129697	2.332859	0.055596	0.287937	0.575874	2.220075	0.28861	1.085096	0.144815
0.16	0.219697	3.863159	0.05687	0.495167	0.990334	2.253864	0.360618	0.992978	0.158503
0.2315	**0.615628**	**7.510374**	**0.08197**	**1.770503**	**3.541005**	**2.875928**	**0.665777**	**1.053355**	**0.248015**
0.24	0.679697	7.943959	0.085561	2.011442	4.022885	2.959322	0.710237	1.064532	0.26072
0.28	1.029697	9.984359	0.103131	3.451244	6.902488	3.351708	0.938478	1.116244	0.323652
0.32	1.459697	12.02476	0.121391	5.454149	10.9083	3.736494	1.195678	1.164022	0.390539
0.36	1.969697	14.06516	0.140041	8.09548	16.19096	4.110013	1.479605	1.207158	0.460401
0.395	2.481572	15.85051	0.156561	10.98642	21.97283	4.4272	1.748744	1.241374	0.523526
0.405	2.639072	16.36061	0.161306	11.91861	23.83723	4.516214	1.829067	1.250602	0.541864

For water depths greater than 0.405 ft but less than 0.667 ft

Y2= Y - 0.405
A3= A2 + Y2*16
P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.41	2.719072	16.36561	0.166145	12.52429	25.04858	4.60609	1.888497	1.267688	0.558092
0.43	3.039072	16.38561	0.185472	15.06376	30.12751	4.956696	2.131379	1.332079	0.6231
0.4463	**3.299872**	**16.40191**	**0.201188**	**17.26788**	**34.53575**	**5.232893**	**2.33544**	**1.380386**	**0.676222**
0.5	4.159072	16.45561	0.252745	25.33912	50.67823	6.092493	3.046246	1.518386	0.852383
0.55	4.959072	16.50561	0.300448	33.90416	67.80832	6.836796	3.760238	1.624588	1.018211
0.59	5.599072	16.54561	0.338402	41.43922	82.87845	7.401088	4.366642	1.698015	1.152186
0.6658	6.811872	16.62141	0.409825	57.28034	114.5607	8.408899	5.598645	1.816098	1.40921
0.667	6.831072	16.62261	0.410951	57.54691	115.0938	8.424287	5.618999	1.817784	1.413311

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667
A4= A3 + 16 * Y3 + 25 * Y3^2
P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	7.386297	18.27294	0.404221	61.54305	123.0861	8.332058	5.83244	1.754993	1.422258
0.73	7.938297	19.77324	0.401467	65.8416	131.6832	8.294172	6.054746	1.710739	1.438448
0.75	8.331297	20.77344	0.401055	69.05399	138.108	8.288504	6.216378	1.686621	1.452814
0.77	8.744297	21.77364	0.4016	72.54278	145.0856	8.29601	6.387928	1.66608	1.469669
0.8	9.401297	23.27394	0.403941	78.29603	156.5921	8.328215	6.662572	1.640888	1.499057
0.82	9.864297	24.27414	0.406371	82.48108	164.9622	8.361578	6.856494	1.627247	1.521072
0.85	10.5963	25.77444	0.411117	89.29026	178.5805	8.426553	7.16257	1.610692	1.557279

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =12/02/1996

INPUT FILE = A:P.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.600
COMPUTE NM HYD	100.10	-	1	.00619	16.82	.610	1.84919	1.510	4.247	PER IMP= 60.00
COMPUTE NM HYD	100.20	-	1	.00587	15.97	.579	1.84919	1.510	4.247	PER IMP= 60.00
COMPUTE NM HYD	100.30	-	1	.00613	16.67	.605	1.84919	1.510	4.247	PER IMP= 60.00
COMPUTE NM HYD	100.40	-	1	.00649	17.64	.640	1.84919	1.510	4.247	PER IMP= 60.00
COMPUTE NM HYD	100.50	-	1	.00253	6.89	.249	1.84918	1.510	4.254	PER IMP= 60.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.730
COMPUTE NM HYD	110.10	-	1	.00619	10.43	.358	1.08384	1.510	2.633	PER IMP= 60.00
COMPUTE NM HYD	110.20	-	1	.00587	9.90	.340	1.08384	1.510	2.634	PER IMP= 60.00
COMPUTE NM HYD	110.30	-	1	.00613	10.34	.355	1.08384	1.510	2.633	PER IMP= 60.00
COMPUTE NM HYD	110.40	-	1	.00649	10.94	.375	1.08384	1.510	2.633	PER IMP= 60.00
COMPUTE NM HYD	110.50	-	1	.00253	4.27	.146	1.08384	1.510	2.638	PER IMP= 60.00
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =12/02/1996
INPUT FILE = A:E.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.600
COMPUTE NM HYD	100.10	-	1	.00619	10.38	.304	.92188	1.510	2.621	PER IMP= .00
COMPUTE NM HYD	100.20	-	1	.00587	9.85	.289	.92188	1.510	2.621	PER IMP= .00
COMPUTE NM HYD	100.30	-	1	.00613	10.29	.302	.92188	1.510	2.621	PER IMP= .00
COMPUTE NM HYD	100.40	-	1	.00649	10.88	.319	.92188	1.510	2.621	PER IMP= .00
COMPUTE NM HYD	100.50	-	1	.00253	4.25	.124	.92188	1.510	2.625	PER IMP= .00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.730
COMPUTE NM HYD	110.10	-	1	.00619	4.67	.117	.35586	1.532	1.178	PER IMP= .00
COMPUTE NM HYD	110.20	-	1	.00587	4.43	.111	.35586	1.532	1.178	PER IMP= .00
COMPUTE NM HYD	110.30	-	1	.00613	4.62	.116	.35586	1.532	1.178	PER IMP= .00
COMPUTE NM HYD	110.40	-	1	.00649	4.89	.123	.35586	1.532	1.178	PER IMP= .00
COMPUTE NM HYD	110.50	-	1	.00253	1.91	.048	.35586	1.532	1.180	PER IMP= .00
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994   RUN DATE (MON/DAY/YR) =01/07/1997
INPUT FILE = a:off.dat   USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.600
COMPUTE NM HYD	100.10	-	1	.01017	17.05	.500	.92188	1.510	2.620	PER IMP= .00
COMPUTE NM HYD	100.20	-	1	.00186	6.02	.234	2.35494	1.510	5.056	PER IMP= 100.00
COMPUTE NM HYD	100.30	-	1	.01361	34.54	1.227	1.69072	1.510	3.967	PER IMP= 50.00
COMPUTE NM HYD	100.40	-	1	.04321	109.64	3.896	1.69072	1.510	3.965	PER IMP= 50.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.730
COMPUTE NM HYD	110.10	-	1	.01017	7.66	.193	.35586	1.532	1.178	PER IMP= .00
COMPUTE NM HYD	110.20	-	1	.00186	4.00	.148	1.49554	1.510	3.359	PER IMP= 100.00
COMPUTE NM HYD	110.30	-	1	.01361	20.74	.697	.95995	1.510	2.381	PER IMP= 50.00
COMPUTE NM HYD	110.40	-	1	.04321	65.82	2.212	.95995	1.510	2.380	PER IMP= 50.00
FINISH										

Interim Drainage Management Plan

Resource Technology Inc. (RTI) has designed a storm drain system in Wyoming Boulevard from north of Wilshire Avenue to south of Corona Avenue. This storm drain system will remove the flood plain from our site that is contributed by a tributary of the Domingo Baca Arroyo. Until the entire storm sewer system is built, an interim solution will be in place on the Falcon Ridge site. The on-site drainage patterns will not change from the ultimate solution.

An earth swale designed to carry the 78.7 cfs (C19-D10) of flow entering our site from Wilshire Avenue will be constructed. The swale will be constructed in the 48 foot right-of-way we are dedicating to Wyoming Blvd. The swale will be 5 feet deep with 3:1 side slopes, and will run from Wilshire Avenue to Corona Ave. The channel depth was also calculated using the 377 cfs of total flow in the Wyoming storm drain. The water will rise to a height of 4.38 feet and stay within the channel.

The storm drain at Corona will be built exactly as the plans from RTI specify. The swale will then continue on the south side of Corona until the point where the storm drain will discharge. An outfall structure will be built with riprap and a concrete cutoff wall to control erosion. The collection structures such as the drop inlets, manholes and connecting pipes in Wilshire Avenue on the west side of Wyoming will also be built. However, they will route the 78.7 cfs of flow into the earth swale until the storm drain is built. The plans specify double D drop inlets, however we are building curb and gutter along Wilshire Avenue so Double A inlets will be used instead. The two double A inlets will have capacity for the entire 78.7 cfs. After the storm drain system is built the earth swale and outfall structure will no longer be needed.

AREA WATERSHED MAP

Pipe Capacity

Manning's Equation:

Q = 1.49/n * A * R^(2/3) * S^(1/2)

A = Area
R = D/4
S = Slope
n = 0.013

Pipe	D	Slope	Area	R	Q Provided	Q Required	Velocity
	(in)	(%)	(ft^2)		(cfs)	(cfs)	(ft/s)
CB1 to CB2	30	1.05	4.91	0.625	42.14	39.35	8.02
CB2 to SWALE	36	1.5	7.07	0.75	81.91	78.70	11.13

DROP INLET
HEAD CAPACITY

Orifice Equation:

$$Q = CA\sqrt{2gH}$$

Q = Flow (cfs)
C = 0.60
A = Area of drop inlet (ft^2)
g = 32.2
H = Height of water above drop inlet (ft)

$$H = \frac{\left(\frac{Q}{C*A}\right)^2}{2g}$$

$$H = \frac{\left(\frac{39.35}{0.6*11.24}\right)^2}{2*32.2}$$

H = 0.53 feet

Allowable depth = 0.67 feet
Required depth = 0.53 feet

0.53 feet < 0.67 feet

STORM DROP INLET (EFFECTIVE AREA-IN PONDING SECTION)
(DBL-A @ the ponding section w/ sweepers on each side)

Area @ the Grate:

L $= 88\ 3/4" - 2\ (6"_{ENDS}) - 6"_{CENTER\ PIECE} - 14\ (1/2"_{MIDDLE\ BARS})$

$= 63\ 3/4" = 5.3125'$

W $= 25\ 1/2" - 13\ (1/2"_{MIDDLE\ BARS})$

$= 19" = 1.5833'$

Area = 5.3125 x 8.41
= 8.41 SF

Effective area $= 8.41 - .5\ (8.41)_{Clogging\ Factor}$

= 4.21 SF @ the Grate

Area @ the Throat:

L = 13.50'

H = 10 ¾" - 4 ½"
= 6 ¼" = 0.5208'

Area = 13.50 x 0.5208
= 7.03 SF @ the Throat

Total Area

Area $= 4.21_{Grate} + 7.03_{Throat}$
= 11.24 SF